

A field guide to portable sequencing

While the supplementary methods describe the process used in the surveillance sequencing of Ebola virus during current outbreak, the following are some general considerations for portable sequencing, which may be applicable to other outbreaks.

Experimental design

The MinION sequences double-stranded DNA, meaning that viral RNA must first be converted to cDNA, although it has been suggested that nanopore technology may in the future permit native sequencing of native RNA (in the form of RNA:cDNA duplexes) and eventually possibly ssRNA in future. The benefit of sequencing native RNA for example, would be to reduce the number of molecular biological steps required to prepare a sequencing library. Currently, if the sample contains high concentrations (>1ug) of DNA of the organism of interest then it may be suitable for direct sequencing. However if the organism is potentially at low abundance within the sample then a PCR enrichment step may be necessary. In situations where the desired information is contained within RNA, it must first be converted to double stranded cDNA via the process of reverse-transcription. This may be coupled with PCR (RT-PCR) in a single reaction tube to perform amplification. RT-PCR can be performed using sequence specific primers, oligo(dT) primers (for mRNA) or random primers (for total cDNA synthesis).

When developing the protocol for this study we considered both tiling amplicons generated by multiple sequence specific RT-PCR reactions and total RNA sequencing using random primers to generate a pool of cDNA. The tiling amplicon approach was chosen for a number of reasons. Firstly we were looking for an approach that would work over a wide range of viral loads. Amplifying regions of the Ebola genome

then pooling the amplicons prior to sequencing allowed us to achieve high coverage of the genome over a wide range of viral loads.

Secondly, we wanted a method robust enough to work reliably in the field. The average output of a MinION flowcell sequencing a single sample can generate thousands of fold coverage of the ~19,000 bp Ebola genome, resulting in adequate coverage to confidently call SNPs even in potentially sub-optimal conditions. Thirdly with the data upload being a major bottleneck, targeted sequencing was preferable as any other sequence uploaded required additional resources but was of no use for the analysis.

Before travelling it is important to understand the data analysis requirements of the experiment as much as possible. If only very limited Internet access is likely to be available it may be worth considering developing tools enabling offline analysis from raw signal data. Often the end-product of an analysis pipeline, for example a consensus sequence of a file containing variants against a reference, will be considerably smaller in size than the input data making it much easier to upload. The raw data can be archived on a portable hard disk in the event that it is required later. The MinNOW software itself requires an Internet connection to ping ONT before a sequencing run will begin. If an Internet connection will not be available a software version that does not perform this check must be arranged and installed in advance (materials available from Oxford Nanopore Technologies).

Packing and transportation

When travelling to perform sequencing in a resource limited setting it is important that you travel with everything you are likely to require, as it may be impossible to acquire certain items. When packing for a field sequencing trip it is helpful to perform an experiment starting with an empty bench in order to ensure that your workflow can be completed from start to finish, recording every item you bring onto

your bench. This list forms the basis of a packing list once you have calculated the number or amount required based on the predicted total number of samples you wish to sequence.

When transporting laboratory equipment it is essential it arrives in working condition. Using hard-cases with foam inserts to transport equipment will minimize the chance of equipment getting damaged. Again, in many places it may be hard to find spare parts or an engineer capable of repairing equipment. Many reagents, such as those required for MinION sequencing need a temperature controlled supply chain. Depending on restrictions frozen items can be transported on dry-ice and remain frozen, otherwise items may remain serviceable if transported on frozen gel packs provided appropriate cold-storage conditions are readily available at the destination. Disposable temperature data loggers are available that can be included in the package and the data downloaded via USB on arrival for inspection.

Ethanol, a commonly used reagent in molecular biology, is considered a hazardous material by International Air Transport Association (IATA). Do not attempt to take ethanol on a plane in either carry-on or checked baggage. In our case, ethanol was already being used for RNA inactivation so was available on arrival. However if none if available an over-proof alcohol such as Vodka or surgical spirit may be a suitable alternative. Some airlines allow dry ice to be used for transporting frozen goods but it must be in a suitable container and clearly labelled. It would be advisable to enquire with your airline about dry ice in advance of travelling.

Setting up a field lab

Setting up a field lab is likely to require some basic infrastructure, particularly power available at the destination. Power supplies would usually take the form of mains AC power or engine-generators both

potentially coupled with backup battery systems. The MinION itself draws power from the laptop to which it is connected and therefore acts like an integrated uninterruptible power supply (UPS) in the event of power cuts. In countries with unreliable mains power infrastructure the use of engine-generators and UPS systems is likely to be common. As these pieces of equipment are very heavy it may be more practical to try to acquire one in country rather than transporting one. The importance of an uninterrupted power supply is therefore likely to rely on your application; at the Coyah sequencing lab, power was provided by diesel generator however outages i.e. during refueling and surges which are common with this type of power supply meant a UPS unit was required to run 3.5 hour RT-PCR programs reliably.

Uneven power flow can also result in temperature fluctuations with refrigeration equipment. Temperature data loggers such as LogTag (LogTag Recorders, Auckland) can be placed alongside reagents to monitor the temperature. This provides confidence that reagents have been properly stored in the event of troubleshooting failures.

The MinION itself very small but the controlling laptop requires some bench space. A comfortable bench space for single sequencer setup including peripherals required for producing sequencing libraries is about 1.5 metres. The sample throughput and number of sequencers should be considered when planning any trip. One laptop is required for each MinION, however multiple samples may be run on a single MinION using the barcoding kit provided by ONT.

Many field laboratories will not have air-conditioning. The MinION can run at elevated ambient temperatures, indeed the temperature in the Coyah lab would exceed 30°C, however no work was done to determine the upper temperature limits. Other MinION access program (MAP) users have devised heat sinks to mount the MinION on which could be useful in very hot environments. Consider these effects on other pieces of labware that likely have not been designed with field

sequencing in mind. The glue securing the magnets in our magnetic separation rack melted due to the temperature and humidity. Any enzymatic reactions that specify ‘room temperature’ may require cooling to function optimally in an excessively hot environment.

Basecalling currently requires an Internet connection. Many places will not have a fixed broadband connection. Wireless access may be the best available option. The cheapest and most ubiquitous wireless option is mobile-broadband, this is provided via the 3G or 4G networks using a smart phone or mobile hotspot. A 3G connection or better can be adequate to run cloud-based basecalling in the field. However in more remote areas the 3G signal strength can be highly variable due to the landscape, weather or unreliable backhaul. Satellite Internet is available in even the most remote locations however connections optimized for high-speed data are often expensive and even a personal BGAN terminal capable of ~500 kbps can cost ~1\$/Mb which will be prohibitive for many applications.

When relying on remote users to perform analysis it is important to have a line of communication between them and laboratory staff. We found the most effective method was via ‘Whatsapp’ (<https://www.whatsapp.com/>), a real-time group messaging application available on iOS and Android smartphones. We found it performed better than other methods tested including email, with the poor internet connection available in the lab itself.

Increasing throughput

In order to reduce costs or increase the sample throughput it may be worth considering multiplexing multiple samples on the same MinION run. A benefit of running a single sample on a single flowcell means the sample can be processed as soon as it becomes available minimizing the time from sample to answer. It may however be preferable to sequence batches of samples to reduce the individual sample cost. The

typical MinION run generates reads in excess of that required to accurately call SNPs for a single Ebola sample; in fact the data requirement was often met in 15 minutes of sequencing. Multiplexing multiple samples can be achieved using sets of barcoded primers for the RT-PCR amplification. This however dramatically increases the number amplicons in a pool and thus the time taken to prepare the library. Some of the more portable thermal cyclers have a smaller tube capacity than full size models that can lead to a bottle-neck at the amplification stage of the process.

Supplementary table 1

Primer Name	Primer Sequence	Reference	Identity	Reference Start	Reference End	E-Value	Bit Score	Tm	19rx	11rx_v1	11rx_v2	11rx_v3
1_F	TTTAGGATCTTGTGTGCGAAT	gil674810549lgbIKJ660346.2l	100	27	49	4.00E-09	46.1	60.017	1F	1F	1F	1F
1_R	CATCCAGACTTTCTGAGGACGA	gil674810549lgbIKJ660346.2l	100	499	478	1.00E-08	44.1	61.711				
2_F	GACGCCGAGTCTCACTGAA	gil674810549lgbIKJ660346.2l	100	499	517	6.00E-07	38.2	60.13				
2_R	TGAACCTTCTCAAGGCAAGC	gil674810549lgbIKJ660346.2l	100	987	968	2.00E-07	40.1	60.517				
3_F	AAGGCTTGCGCTTGAGAAGGT	gil674810549lgbIKJ660346.2l	100	965	984	2.00E-07	40.1	60.382	2F			
3_R	ACTCCTGCGAGGGTGCTC	gil674810549lgbIKJ660346.2l	100	1470	1453	2.00E-06	36.2	61.577	1R			
4_F	CCCTCGCAGGAGTAAATGTTG	gil674810549lgbIKJ660346.2l	100	1458	1478	5.00E-08	42.1	61.897				
4_R	TGGTGTCCCTCGTCCT	gil674810549lgbIKJ660346.2l	100	1955	1938	2.00E-06	36.2	60.252	2R	1R	1R	1R
5_F	CGATCTAGACGAGGACGACGA	gil674810549lgbIKJ660346.2l	100	1927	1947	5.00E-08	42.1	62.792	3F	2F	2F	2F
5_R	TCTGGCTGGGTGTTGTAC	gil674810549lgbIKJ660346.2l	100	2403	2385	6.00E-07	38.2	60.742				
6_F	ACAACACCCAGCCAGAACAA	gil674810549lgbIKJ660346.2l	100	2388	2406	6.00E-07	38.2	60.146				
6_R	TGTGGCTTAACGCTTATTGCG	gil674810549lgbIKJ660346.2l	100	2899	2879	5.00E-08	42.1	60.272	3R			
7_F	GCGTTAACGCCACAGTTATAGCC	gil674810549lgbIKJ660346.2l	100	2887	2908	1.00E-08	44.1	60.174	4F			
7_R	ATTGCAAATTGGGTCCGTTT	gil674810549lgbIKJ660346.2l	100	3368	3349	2.00E-07	40.1	61.449				
8_F	AACCCAAACGGACCCAAT	gil674810549lgbIKJ660346.2l	100	3344	3361	2.00E-06	36.2	60.027				
8_R	TGGAAAGCAGTCCAAAACC	gil674810549lgbIKJ660346.2l	100	3847	3828	2.00E-07	40.1	60.088	4R	2R	2R	2R
9_F	TGCCTGGTTTGGAACTGC	gil674810549lgbIKJ660346.2l	100	3823	3841	6.00E-07	38.2	62.175	5F	3F	3F	3F
9_R	AGCTGCTAGCGGGATATGAAC	gil674810549lgbIKJ660346.2l	100	4312	4292	5.00E-08	42.1	60.745				
10_F	TCATATCCCGCTAGCAGCTTA	gil674810549lgbIKJ660346.2l	100	4294	4315	1.00E-08	44.1	61.174				
10_R	CAGCGACACCTAGAGGAAGC	gil674810549lgbIKJ660346.2l	100	4782	4763	2.00E-07	40.1	60.156	5R			
11_F	TTGGCTTCCTCTAGGTGTCG	gil674810549lgbIKJ660346.2l	100	4760	4779	2.00E-07	40.1	60.388	6F			
11_R	CCAGAGTTCTGGCACTTCG	gil674810549lgbIKJ660346.2l	100	5280	5261	2.00E-07	40.1	60.964				
12_F	TGGGTATCGAACGTGCCAGA	gil674810549lgbIKJ660346.2l	100	5254	5272	6.00E-07	38.2	60.209				
12_R	TGCAATGAGAAAGATTGACATTG	gil674810549lgbIKJ660346.2l	100	5741	5718	1.00E-09	48.1	61.34	6R	3R	3R	3R
13_F	TCCTCAAATTGCCTACATGCTT	gil674810549lgbIKJ660346.2l	100	5759	5780	1.00E-08	44.1	60.976	7F	4F	4F	4F
13_R	TCTCAATTGATTGTGGATGACA	gil674810549lgbIKJ660346.2l	100	6230	6208	4.00E-09	46.1	60.359				
14_F	CGTGACAAACTGTCATCCACA	gil674810549lgbIKJ660346.2l	100	6198	6218	5.00E-08	42.1	60.622				
14_R	TGTGGTAGAATAATAGCCACTCGAC	gil674810549lgbIKJ660346.2l	100	6689	6665	3.00E-10	50.1	60.75	7R			
15_F	GGACCCGTCGAGTGGCTAT	gil674810549lgbIKJ660346.2l	100	6659	6677	6.00E-07	38.2	62.397	8F			
15_R	GGCAAGGGTTGTCAGATGC	gil674810549lgbIKJ660346.2l	100	7144	7126	6.00E-07	38.2	61.642				
16_F	AAAACAGGTCCGGACAACAG	gil674810549lgbIKJ660346.2l	100	7178	7197	2.00E-07	40.1	60.005				
16_R	GCTGGCCCGAAATATGGT	gil674810549lgbIKJ660346.2l	100	7650	7633	2.00E-06	36.2	60.833	8R	4R	4R	4R
17_F	GATGAAGGTGCTGCAATCG	gil674810549lgbIKJ660346.2l	100	7601	7619	6.00E-07	38.2	60.369	9F	5F	5F	5F
17_R	TTGCCGTGAAACAATCTGAA	gil674810549lgbIKJ660346.2l	100	8094	8075	2.00E-07	40.1	60.234				
18_F	TTTCACGGCAAAACTCAACC	gil674810549lgbIKJ660346.2l	100	8084	8103	2.00E-07	40.1	61.041				

18_R	GCTCGAACATGGTGGTCGT	gil674810549lgbIKJ660346.2l	100	8588	8570	6.00E-07	38.2	62.147	9R						
19_F	GGATGGACACGACCACCA	gil674810549lgbIKJ660346.2l	100	8562	8579	2.00E-06	36.2	61.461	10F						
19_R	TTCCTCGTCATCACAGCACA	gil674810549lgbIKJ660346.2l	100	9047	9028	2.00E-07	40.1	61.477		5R					
20_F	AACCCAAACATTGACCAAAGAA	gil674810549lgbIKJ660346.2l	100	9550	9571	1.00E-08	44.1	60.603		6F	6F	6F			
20_R	GGGCAACTGGTATAACAGCTAAAG	gil674810549lgbIKJ660346.2l	100	10030	10007	1.00E-09	48.1	60.409	10R		5R	5R			
21_F	TGTATACCAGTTGCCCTGAG	gil674810549lgbIKJ660346.2l	100	10015	10035	5.00E-08	42.1	60.001	11F						
21_R	TCAAACTAATACCAGCCCAAT	gil674810549lgbIKJ660346.2l	100	10487	10466	1.00E-08	44.1	60.721							
22_F	TTGGGCTGGTATTGAGTTGA	gil674810549lgbIKJ660346.2l	100	10467	10487	5.00E-08	42.1	60.487							
22_R	CCACCAGAAAACCCATGTTAGT	gil674810549lgbIKJ660346.2l	100	10942	10921	1.00E-08	44.1	60.144	11R	6R	6R	6R			
23_F	GCTCCAAGAACCGACAAA	gil674810549lgbIKJ660346.2l	100	10944	10962	6.00E-07	38.2	61.172	12F	7F	7F	7F			
23_R	CACATGACCTGCAGGGTTA	gil674810549lgbIKJ660346.2l	100	11420	11402	6.00E-07	38.2	60.523							
24_F	CCCCCAGGTCATGTGTGT	gil674810549lgbIKJ660346.2l	100	11406	11423	2.00E-06	36.2	61.67							
24_R	TCAGGAAGAGAGCATCTTGCAT	gil674810549lgbIKJ660346.2l	100	11923	11902	1.00E-08	44.1	61.42	12R						
25_F	TGCAAGATGCTCTCTCCTGA	gil674810549lgbIKJ660346.2l	100	11903	11923	5.00E-08	42.1	61.212	13F						
25_R	AGCAAACCTGGGCTCTCAACC	gil674810549lgbIKJ660346.2l	100	12373	12354	2.00E-07	40.1	61.455		7R	7R	7R			
26_F	GGTTGAGGACCCAGTTGC	gil674810549lgbIKJ660346.2l	100	12354	12372	6.00E-07	38.2	60.504	14F	8F	8F	8F			
26_R	CTGAGGTAACACTGTACCAAGATCC	gil674810549lgbIKJ660346.2l	100	12874	12850	3.00E-10	50.1	60.33	13R						
27_F	AGGATCTGGTACAGTGTACCTCA	gil674810549lgbIKJ660346.2l	100	12849	12873	3.00E-10	50.1	60.33							
27_R	CAGCTAACAGAGCTTCACAAAGTGT	gil674810549lgbIKJ660346.2l	100	13327	13303	3.00E-10	50.1	61.337							
28_F	TGGTCTTGCTAACAGCATTTCCT	gil674810549lgbIKJ660346.2l	100	13329	13350	1.00E-08	44.1	60.257							
28_R	ATGCACTGATTGTCACCCATC	gil674810549lgbIKJ660346.2l	100	13817	13797	5.00E-08	42.1	60.807							
29_F	TTGCGCTCAGCTGTGATG	gil674810549lgbIKJ660346.2l	100	13783	13800	2.00E-06	36.2	60.907	15F						
29_R	CCGAAATCCAGAGGTTGC	gil674810549lgbIKJ660346.2l	100	14270	14252	6.00E-07	38.2	60.588	14R	8R	8R	8R			
30_F	CAAACCTCTGGATTCGGAAC	gil674810549lgbIKJ660346.2l	100	14253	14273	5.00E-08	42.1	60.841		9F	9F	9F			
30_R	TAATGTGCGTGTTCCTTCCA	gil674810549lgbIKJ660346.2l	100	14748	14729	2.00E-07	40.1	60.111	15R						
31_F	GAGACGCCGGTTGGAC	gil674810549lgbIKJ660346.2l	100	14779	14796	2.00E-06	36.2	61.625	16F						
31_R	GCCAATTCAATGGCCTCTC	gil674810549lgbIKJ660346.2l	100	15248	15230	6.00E-07	38.2	60.564							
32_F	ATGTCCTCCGCAGCCTTA	gil674810549lgbIKJ660346.2l	100	15210	15228	6.00E-07	38.2	60.75							
32_R	CTCGGTATCTGTTAAATCTAAATCCA	gil674810549lgbIKJ660346.2l	100	15706	15680	2.00E-11	54	60.146	16R	9R	9R	9R			
33_F	TTAACAAAGATAACCGAGAAAATGAATTG	gil674810549lgbIKJ660346.2l	100	15691	15717	2.00E-11	54	60.862	17F	10F	10F	10F			
33_R	GGGGATCAATACTCATTAATCGTGAC	gil674810549lgbIKJ660346.2l	100	16165	16140	7.00E-11	52	62.918							
34_F	TGCTGCAGGTGACAGAGGA	gil674810549lgbIKJ660346.2l	100	16188	16206	6.00E-07	38.2	61.828							
34_R	CATGGCTCATTTGCAGGAC	gil674810549lgbIKJ660346.2l	100	16672	16654	6.00E-07	38.2	60.217	17R						
35_F	TGATGGCACTGAACGGAGT	gil674810549lgbIKJ660346.2l	100	16632	16650	6.00E-07	38.2	60.263	18F		11F	11F			
35_R	AAGGCACCAGCACCTCTC	gil674810549lgbIKJ660346.2l	100	17105	17087	6.00E-07	38.2	60.402		10R	10R	10R			
36_F	AACACGCTAGCTACTGAGTCCAG	gil674810549lgbIKJ660346.2l	100	17146	17168	4.00E-09	46.1	60.143		11F					
36_R	TGGTGTGGCATCTTACGTGTAG	gil674810549lgbIKJ660346.2l	100	17630	17609	1.00E-08	44.1	60.992	18R						

37_F	TGGTATCTTGCTGACGAACCTCT	gil674810549lgbIKJ660346.2l	100	17578	17602	3.00E-10	50.1	60.556	19F
37_R	CAACTCTGGTAATTCTAAACTCAGC	gil674810549lgbIKJ660346.2l	100	18051	18025	2.00E-11	54	60.118	
38_F	TGAAGAACGTTCTTAGTCAAACC	gil674810549lgbIKJ660346.2l	100	18096	18120	3.00E-10	50.1	60.083	
38_R	GTGTTATCAACCAAAGCACTATTCCA	gil674810549lgbIKJ660346.2l	100	18578	18553	7.00E-11	52	62.478	19R 11R 11R 11R

Supplementary table 2

Sample ID	Sample Collection Date	Passing Reads	Failing Reads	Total Reads	Passing Rate	Sequencing Date	Duration Minutes	Reads Per Minute
EM_COY_2015_014370	2015-04-07	6929	3374	10303	67.25	2015-04-18	27.58	373.52
EM_COY_2015_015802	2015-04-14	4377	5995	10372	42.20	2015-04-20	39.93	259.73
EM_COY_2015_015815	2015-04-14	6675	4268	10943	61.00	2015-04-20	37.33	293.12
EM_GUI_2015_004674	2015-03-26	2667	1940	4607	57.89	2015-04-21	48.93	94.15
EM_COY_2015_015972	2015-04-20	2049	1504	3553	57.67	2015-04-22	28.77	123.51
EM_COY_2015_015986	2015-04-20	2650	2232	4882	54.28	2015-04-22	28.80	169.51
EM_COY_2015_013671	2015-03-12	6022	3995	10017	60.12	2015-04-23	44.87	223.26
EM_COY_2015_013731	2015-03-14	5420	4594	10014	54.12	2015-04-23	37.48	267.16
EM_COY_2015_014098	2015-03-26	5320	4843	10163	52.35	2015-04-24	44.90	226.35
EM_COY_2015_014100	2015-03-26	4756	5612	10368	45.87	2015-04-24	167.42	61.93
EM_COY_2015_013857	2015-03-18	3304	1697	5001	66.07	2015-04-25	25.28	197.80
EM_COY_2015_013962	2015-03-22	2526	2495	5021	50.31	2015-04-25	23.87	210.38
EM_COY_2015_015980	2015-04-20	2482	2529	5011	49.53	2015-04-25	31.77	157.74
EM_COY_2015_015982	2015-04-20	1716	3281	4997	34.34	2015-04-26	691.42	7.23
EM_FORE_2015_216	2015-04-30	1211	5916	7127	16.99	2015-05-06	89.72	79.44
EM_FORE_2015_209	2015-04-28	117	4625	4742	2.47	2015-05-06	387.08	12.25
IPDPFHGINSP_GUI_2015_6505	2015-05-03	3121	5569	8690	35.91	2015-05-07	46.30	187.69
EM_COY_2015_016238	2015-05-03	2675	4017	6692	39.97	2015-05-07	48.13	139.03
EM_COY_2015_016263	2015-05-04	1374	4310	5684	24.17	2015-05-08	31.48	180.54
EM_COY_2015_016267	2015-05-04	2702	4088	6790	39.79	2015-05-08	66.17	102.62
EM_COY_2015_016414	2015-05-11	1992	3523	5515	36.12	2015-05-14	96.10	57.39
EM_COY_2015_016456	2015-05-12	3652	2473	6125	59.62	2015-05-14	76.65	79.91
EM_COY_2015_016449	2015-05-11	3893	2975	6868	56.68	2015-05-14	80.28	85.55
EM_COY_2015_016483	2015-05-13	1942	2071	4013	48.39	2015-05-15	26.58	150.96
EM_COY_2015_016515	2015-05-14	3588	1685	5273	68.04	2015-05-15	30.72	171.67
EM_COY_2015_016531	2015-05-14	2025	3041	5066	39.97	2015-05-15	31.22	162.29
EM_COY_2015_014060	2015-03-25	2762	1672	4434	62.29	2015-05-15	26.42	167.85
EM_COY_2015_016236	2015-05-03	4834	6045	10879	44.43	2015-05-18	55.38	196.43
EM_COY_2015_016617	2015-05-16	2033	2863	4896	41.52	2015-05-18	39.45	124.11
EM_COY_2015_016278	2015-05-05	1856	3469	5325	34.85	2015-05-18	102.27	52.07
EM_COY_2015_016642	2015-05-17	3612	2224	5836	61.89	2015-05-19	32.53	179.39
EM_COY_2015_016293	2015-05-06	2977	3737	6714	44.34	2015-05-20	117.35	57.21
EM_COY_2015_013576	2015-03-09	4424	2871	7295	60.64	2015-05-19	45.93	158.82
EM_COY_2015_013795	2015-03-16	2365	2715	5080	46.56	2015-05-18	46.52	109.21
EM_COY_2015_014102	2015-03-26	2603	2530	5133	50.71	2015-05-21	46.18	111.14

EM_COY_2015_016743	2015-05-19	1226	4035	5261	23.30	2015-05-21	41.25	127.54
EM_COY_2015_016743	<i>second batch</i>	3753	5307	9060	41.42	2015-11-01	55.00	164.00
EM_COY_2015_016800	2015-05-20	3606	3065	6671	54.05	2015-05-22	32.57	204.84
EM_COY_2015_016464	2015-05-12	4914	11256	16170	30.39	2015-05-14	49.03	329.78
EM_FORE_2015_343	2015-05-11	4529	5153	9682	46.78	2015-05-22	32.35	299.29
EM_FORE_2015_343	<i>second batch</i>	2358	5212	7570	31.15	2015-05-19	51.00	148.00
EM_COY_2015_016854	2015-05-22	2146	5078	7224	29.71	2015-05-24	75.30	95.94
EM_COY_2015_014465	2015-04-11	4555	6405	10960	41.56	2015-05-21	34.75	315.40
EM_FORE_2015_387	2015-05-16	2815	10362	13177	21.36	2015-05-22	112.82	116.80
EM_COY_2015_017021	2015-05-25	2362	5097	7459	31.67	2015-05-29	401.03	18.60
EM_COY_2015_017018	2015-05-26	2158	5164	7322	29.47	2015-05-31	104.50	70.07
EM_COY_2015_017057	2015-05-27	2726	6695	9421	28.94	2015-05-29	110.38	85.35
EM_COY_2015_016852	2015-05-22	1546	3573	5119	30.20	2015-05-24	83.03	61.65
EM_COY_2015_016852	<i>second batch</i>	1421	5172	6593	21.55	2015-05-31	107.00	61.00
EM_COY_2015_017091	2015-05-28	3577	3648	7225	49.51	2015-06-01	85.57	84.44
EM_COY_2015_017135	2015-05-29	2440	4465	6905	35.34	2015-06-01	115.97	59.54
EM_COY_2015_015984	2015-04-20	1314	5360	6674	19.69	2015-05-25	75.93	87.89
EM_COY_2015_017174	2015-05-30	1811	4242	6053	29.92	2015-06-05	70.85	85.43
EM_COY_2015_017238	2015-05-31	2501	4728	7229	34.60	2015-06-06	42.62	169.63
EM_COY_2015_017240	2015-05-31	1675	2651	4326	38.72	2015-06-08	54.18	79.84
EM_COY_2015_014261	2015-04-02	2633	3350	5983	44.01	2015-06-09	36.02	166.12
EM_FORE_2015_695	2015-06-07	1641	2662	4303	38.14	2015-06-10	30.47	141.24
EM_FORE_2015_696	2015-06-07	2345	2250	4595	51.03	2015-06-10	58.42	78.66
EM_FORE_2015_697	2015-06-07	750	1669	2419	31.00	2015-06-12	150.60	16.06
EM_COY_2015_017574	2015-06-10	1599	3033	4632	34.52	2015-06-12	64.55	71.76
EM_COY_2015_017664	2015-06-12	2021	2531	4552	44.40	2015-06-17	46.00	98.96
EM_COY_2015_017666	2015-06-12	1346	3210	4556	29.54	2015-06-17	48.08	94.75
IPDPFHGINSP_GUI_2015_5038	2015-04-01	948	3885	4833	19.62	2015-06-18	114.98	42.03
IPDPFHGINSP_GUI_2015_5038	<i>second batch</i>	500	3521	4021	12.43	2015-06-18	327.00	12.00
EM_FORE_2015_781	2015-06-13	947	3431	4378	21.63	2015-06-19	33.52	130.62
EM_COY_2015_017788	2015-06-16	932	3474	4406	21.15	2015-06-19	23.10	190.74
EM_COY_2015_017788	<i>second batch</i>	1166	4634	5800	20.10	2015-06-19	53.00	109.00
EM_COY_2015_017865	2015-06-18	1568	3115	4683	33.48	2015-06-20	89.97	52.05
EM_FORE_2015_816	2015-06-15	1204	4508	5712	21.08	2015-06-21	321.90	17.74
EM_COY_2015_017790	2015-06-16	148	2402	2550	5.80	2015-06-22	175.63	14.52
KG12	2015-05-27	1008	6684	7692	13.10	2015-06-23	2940.95	2.62
KG90	2015-06-19	461	4260	4721	9.76	2015-06-24	385.97	12.23

EM_FORE_2015_934	2015-06-23	818	4168	4986	16.41	2015-06-26	125.97	39.58
EM_FORE_2015_896	2015-06-20	1152	4237	5389	21.38	2015-06-23	4184.18	1.29
CON-8559	2015-06-21	2009	2764	4773	42.09	2015-06-29	57.25	83.37
KG45	2015-06-09	1882	3517	5399	34.86	2015-06-29	1254.95	4.30
EM_FORE_2015_1023	2015-06-29	1921	2776	4697	40.90	2015-06-30	93.18	50.41
CON-8811	2015-06-27	2109	2457	4566	46.19	2015-07-01	103.45	44.14
EM_FORE_2015_1024	2015-06-29	2385	1858	4243	56.21	2015-07-01	61.48	69.01
KG35	2015-06-08	1312	3078	4390	29.89	2015-07-02	144.73	30.33
EM_FORE_2015_1047	2015-06-30	1102	4668	5770	19.10	2015-07-02	155.57	37.09
EM_COY_2015_022059	2015-07-02	184	4715	4899	3.76	2015-07-04	391.50	12.51
EM_COY_2015_022059	<i>second batch</i>	707	5168	5875	12.03	2015-07-05	6035.00	0.00
EM_FORE_2015_1140	2015-07-03	567	2190	2757	20.57	2015-07-05	145.03	19.01
GUI_CTS_2015_0050	2015-06-20	1576	4048	5624	28.02	2015-07-06	143.83	39.10
KG87	2015-06-19	3651	3020	6671	54.73	2015-07-13	63.83	104.51
KG88	2015-06-19	1496	3705	5201	28.76	2015-07-14	69.88	74.42
EM_FORE_2015_1313	2015-07-10	2490	3826	6316	39.42	2015-07-13	110.22	57.31
KG80	2015-06-18	1967	3540	5507	35.72	2015-07-14	241.82	22.77
KG91	2015-06-20	3115	2830	5945	52.40	2015-07-13	63.88	93.06
EM_FORE_2015_1118	2015-07-02	1833	3578	5411	33.88	2015-07-15	77.58	69.74
REDC-GUI-2015-00402	2015-07-08	2925	2226	5151	56.79	2015-07-13	178.35	28.88
IPDPFHGINSP_GUI_2015_6899	2015-05-14	1991	3493	5484	36.31	2015-07-17	41.05	133.59
GUI_CTS_2015_0051	2015-06-21	1703	4031	5734	29.70	2015-07-17	35.93	159.57
IPDPFHGINSP_GUI_2015_7070	2015-05-18	2406	3971	6377	37.73	2015-07-18	32.57	195.81
REDC_GUI_2015_00483	2015-07-12	2203	3530	5733	38.43	2015-07-20	61.45	93.30
REDC-GUI-2015-00502	2015-07-13	1476	3687	5163	28.59	2015-07-18	37.22	138.73
REDC-GUI-2015-00497	2015-07-12	1744	15082	16826	10.36	2015-07-18	90.60	185.72
REDC_GUI_2015_00469	2015-07-11	3566	12583	16149	22.08	2015-07-21	38.85	415.68
IPDPFHGINSP_GUI_2015_4786	2015-03-26	1357	2967	4324	31.38	2015-07-21	17.95	240.89
EM_FORE_2015_1437	2015-07-15	2057	3507	5564	36.97	2015-07-23	40.52	137.33
REDC_GUI_2015_00470	2015-07-11	3675	9500	13175	27.89	2015-07-22	51.05	258.08
IPDPFHGINSP_GUI_2015_5117	2015-04-03	2561	2981	5542	46.21	2015-07-24	57.70	96.05
GUI_CTS_2015_0052	2015-06-25	3425	2646	6071	56.42	2015-07-24	19.32	314.29
EM_FORE_2015_1079	2015-07-01	1957	3474	5431	36.03	2015-07-29	56.92	95.42
EM_FORE_2015_1076	2015-07-01	327	3046	3373	9.69	2015-07-29	301.43	11.19
EM_COY_2015_017787	2015-06-16	2543	3097	5640	45.09	2015-07-29	32.97	171.08
IPDPFHGINSP_GUI_2015_4909	2015-03-29	1793	4563	6356	28.21	2015-07-22	47.58	133.58
IPDPFHGINSP_GUI_2015_5339	2015-04-08	2411	4148	6559	36.76	2015-07-22	26.95	243.38

REDC_GUI_2015_00494B	2015-07-12	3583	6906	10489	34.16	2015-07-18	553.62	18.95
EM_FORE_2015_875	2015-06-17	1630	5634	7264	22.44	2015-07-30	28.12	258.35
REDC_GUI_2015_00589	2015-07-15	3542	4640	8182	43.29	2015-08-01	140.73	58.14
REDC_GUI_2015_00545	2015-07-15	3642	2988	6630	54.93	2015-08-01	20.03	330.95
REDC_GUI_2015_00534	2015-07-15	335	508	843	39.74	2015-08-01	64.68	13.03
REDC_GUI_2015_00627	2015-07-18	1212	4584	5796	20.91	2015-08-01	18.80	308.30
EM_FORE_2015_1415	2015-07-20	3476	6363	9839	35.33	2015-08-03	23.47	419.28
EM-FORE_2015_1160	2015-07-13	5302	8540	13842	38.30	2015-08-03	36.35	380.80
EM-FORE-2015-548	2015-05-27	3513	6053	9566	36.72	2015-08-04	78.90	121.24
REDC_GUI_2015_00576	2015-07-17	1640	7952	9592	17.10	2015-08-03	33.63	285.19
EM-FORE-2015-631	2015-06-02	3016	7445	10461	28.83	2015-08-05	38.60	271.01
EM-FORE-2015-838	2015-06-16	3335	6877	10212	32.66	2015-08-05	32.30	316.16
EM-FORE-2015-664	2015-06-04	6049	9355	15404	39.27	2015-08-05	63.02	244.44
EM-FORE-2015-1414	2015-07-13	2438	8800	11238	21.69	2015-08-06	35.00	321.09
EM-FORE-2015-669	2015-06-05	4108	5458	9566	42.94	2015-08-07	33.82	282.88
CON-10193	2015-08-03	5628	5475	11103	50.69	2015-08-07	51.12	217.21
EM_FORE_2015-1789	2015-08-03	848	9760	10608	7.99	2015-08-12	69.87	151.83
EM_FORE_2015-1971	2015-08-14	3494	6371	9865	35.42	2015-08-15	69.65	141.64
REDC_GUI_2015_01285	2015-08-24	3407	9467	12874	26.46	2015-08-30	101.87	126.38
CON-11010	2015-08-23	3821	5587	9408	40.61	2015-08-31	54.42	172.89
CON-10512	2015-08-11	5126	4793	9919	51.68	2015-09-02	62.97	157.53
CON-10590	2015-08-13	4192	5155	9347	44.85	2015-09-02	74.48	125.49
CON-10786	2015-08-17	3830	6469	10299	37.19	2015-09-02	72.08	142.88
EM_COY_2015_023747	2015-09-09	1959	9088	11047	17.73	2015-09-10	136.47	80.95
KG167	2015-06-29	4101	6246	10347	39.63	2015-09-13	45.00	229.93
KG168	2015-06-29	2950	7795	10745	27.45	2015-09-14	124.27	86.47
EM_FORE_2015-2417	2015-09-15	3494	7285	10779	32.41	2015-09-20	91.80	117.42
EM_COY_2015_023888	2015-09-15	3505	6954	10459	33.51	2015-09-22	63.58	164.49
EM_FORE_2015-2531	2015-09-26	1267	10098	11365	11.15	2015-09-28	307.33	36.98
EM_FORE_2015-2533	2015-09-26	3015	9048	12063	24.99	2015-09-27	134.12	89.94
EM_FORE_2015-2547	2015-09-26	697	5421	6118	11.39	2015-09-28	146.62	41.73
EM_FORE_2015-2549	2015-09-26	471	2192	2663	17.69	2015-09-29	225.27	11.82
CON12930	2015-10-13	1320	7886	9206	14.34	2015-10-15	79.17	116.29
EM_FORE_2015_2878	2015-10-24	2590	6270	8860	29.23	2015-10-25	222.62	39.80
EM_FORE_2015_2781	2015-10-13	5608	4373	9981	56.19	2015-10-18	24.88	401.11
REDC_GUI_2015_02242	2015-10-24	5338	4854	10192	52.37	2015-10-29	71.47	142.61
REDC_GUI_2015_01408	2015-09-01	4002	6469	10471	38.22	2015-10-30	48.65	215.23

REDC_GUI_2015_01323	2015-08-27	3836	6975	10811	35.48	2015-10-30	56.38	191.74
REDC_GUI_2015_01165	2015-08-18	3323	7087	10410	31.92	2015-10-30	49.93	208.48

Supplementary table 3

Sample ID	Aligned 2D Reads	Mean Coverage	Median Coverage	Bases Cov >25x	Covered >25x Perc	True Positive Rate
EM_COY_2015_014370	8107	400.2537581	363	18495	97.55	1.00
EM_COY_2015_015802	6839	492.0957856	443	17985	94.86	1.00
EM_COY_2015_015815	6970	523.1761696	505	17982	94.85	1.00
EM_GUI_2015_004674	3280	247.9039506	209	17984	94.86	1.00
EM_COY_2015_015972	2414	195.1172003	166	18513	97.65	1.00
EM_COY_2015_015986	2808	224.4235455	168	17588	92.77	0.90
EM_COY_2015_013671	5895	477.2616699	360	18525	97.71	1.00
EM_COY_2015_013731	4182	310.4848357	95	17026	89.80	0.97
EM_COY_2015_014098	5769	450.6188618	349	18524	97.71	1.00
EM_COY_2015_014100	6401	485.9753152	427	18527	97.72	1.00
EM_COY_2015_013857	3632	296.4599399	269	18525	97.71	1.00
EM_COY_2015_013962	2226	177.3000158	134	18505	97.61	1.00
EM_COY_2015_015980	3045	241.9081703	214	18522	97.70	1.00
EM_COY_2015_015982	2319	184.0227333	161	18518	97.67	1.00
EM_FORE_2015_216	1928	126.6383776	58	14735	77.72	0.70
EM_FORE_2015_209	262	21.81022206	23	8697	45.87	0.37
IPDPFHGINSP_GUI_2015_6505	3188	249.7562108	228	18510	97.63	1.00
EM_COY_2015_016238	4435	338.0418798	289	18526	97.72	1.00
EM_COY_2015_016263	3840	265.7352181	152	17954	94.70	1.00
EM_COY_2015_016267	4105	285.837175	251	17984	94.86	1.00
EM_COY_2015_016414	3445	254.931431	229	17966	94.76	1.00
EM_COY_2015_016456	4561	347.8464581	257	17972	94.79	1.00
EM_COY_2015_016449	5138	388.7551559	278	17969	94.78	1.00
EM_COY_2015_016483	2755	203.767762	136	17961	94.74	1.00
EM_COY_2015_016515	4184	317.5343109	318	17961	94.74	1.00
EM_COY_2015_016531	3716	268.9033704	225	17967	94.77	1.00
EM_COY_2015_014060	3108	231.0418798	167	17958	94.72	1.00
EM_COY_2015_016236	4614	377.3248062	396	18522	97.70	1.00
EM_COY_2015_016617	3276	260.6697611	236	18525	97.71	1.00
EM_COY_2015_016278	3645	286.9723087	296	18523	97.70	1.00
EM_COY_2015_016642	4378	361.5405348	237	18501	97.58	1.00
EM_COY_2015_016293	4793	357.1857165	233	18522	97.70	1.00
EM_COY_2015_013576	5806	466.968089	418	18526	97.72	1.00
EM_COY_2015_013795	3721	265.4051901	108	16629	87.71	0.93
EM_COY_2015_014102	3577	290.4815127	261	18506	97.61	1.00

EM_COY_2015_016743	2557	169.2018039	129	18499	97.57	0.90
EM_COY_2015_016800	4879	382.6313624	346	18525	97.71	1.00
EM_COY_2015_016464	3992	250.8896039	54	11664	61.52	0.53
EM_FORE_2015_343	6587	370.5317791	245	14625	77.14	0.70
EM_COY_2015_016854	799	55.97890184	45	9709	51.21	0.40
EM_COY_2015_014465	2094	159.7434991	106	11728	61.86	0.53
EM_FORE_2015_387	3790	240.5085711	170	10946	57.74	0.53
EM_COY_2015_017021	3978	297.3423176	208	18525	97.71	1.00
EM_COY_2015_017018	3447	266.4514479	213	18522	97.70	1.00
EM_COY_2015_017057	4012	289.0434095	162	18516	97.66	1.00
EM_COY_2015_016852	1654	124.241152	73	13603	71.75	0.70
EM_COY_2015_017091	4102	316.5736589	244	18518	97.67	1.00
EM_COY_2015_017135	2721	219.87051	204	17588	92.77	0.90
EM_COY_2015_015984	914	66.64998154	2	8080	42.62	0.40
EM_COY_2015_017174	2923	133.704362	91	17265	91.06	0.90
EM_COY_2015_017238	4706	357.4473337	333	18525	97.71	1.00
EM_COY_2015_017240	2726	202.2071839	199	18524	97.71	1.00
EM_COY_2015_014261	3305	158.1996941	147	17950	94.68	1.00
EM_FORE_2015_695	3135	245.0458358	150	18523	97.70	1.00
EM_FORE_2015_696	3025	245.2076586	223	18525	97.71	1.00
EM_FORE_2015_697	1115	91.01629833	75	18454	97.34	1.00
EM_COY_2015_017574	2162	169.2395169	126	17571	92.68	0.90
EM_COY_2015_017664	2715	204.0841289	69	17734	93.54	0.97
EM_COY_2015_017666	2302	179.0502136	131	18524	97.71	1.00
IPDPFHGINSP_GUI_2015_5038	1971	154.0063822	140	16559	87.34	0.90
EM_FORE_2015_781	2596	196.5144259	178	18522	97.70	1.00
EM_COY_2015_017788	4815	339.9657682	275	18527	97.72	1.00
EM_COY_2015_017865	2925	222.1389314	200	18522	97.70	1.00
EM_FORE_2015_816	3346	243.1549132	180	18523	97.70	1.00
EM_COY_2015_017790	946	59.73205338	41	10598	55.90	0.50
KG12	2902	209.9310618	185	18525	97.71	1.00
KG90	1438	92.69365473	67	17998	94.93	0.97
EM_FORE_2015_934	2148	98.8131758	69	18164	95.81	1.00
EM_FORE_2015_896	2758	126.899309	98	18182	95.90	1.00
CON-8559	3096	222.7157551	178	18505	97.61	1.00
KG45	3194	287.8843293	167	17381	91.68	1.00
EM_FORE_2015_1023	2844	228.7289414	185	18525	97.71	1.00

CON-8811	2820	219.8451923	209	18526	97.72	1.00
EM_FORE_2015_1024	2678	219.5787753	185	18506	97.61	1.00
KG35	2787	194.2028061	93	15140	79.86	0.93
EM_FORE_2015_1047	2841	170.8852788	115	18518	97.67	1.00
EM_COY_2015_022059	3269	142.7204494	106	18477	97.46	1.00
EM_FORE_2015_1140	1789	81.0676196	57	17526	92.44	1.00
GUI_CTS_2015_0050	3596	170.5606308	132	18041	95.16	1.00
KG87	4789	391.937444	285	18524	97.71	1.00
KG88	2796	223.0825465	196	18524	97.71	1.00
EM_FORE_2015_1313	3713	286.9430877	267	18514	97.65	1.00
KG80	3401	269.627934	214	18526	97.72	1.00
KG91	4164	332.0931484	264	18523	97.70	1.00
EM_FORE_2015_1118	3422	270.2070784	242	18525	97.71	1.00
REDC-GUI-2015-00402	3289	278.2144628	231	18525	97.71	1.00
IPDPFHGINSP_GUI_2015_6899	3456	161.5253969	129	18477	97.46	1.00
GUI_CTS_2015_0051	3121	155.4343056	113	16901	89.14	0.90
IPDPFHGINSP_GUI_2015_7070	4145	193.8024685	138	18483	97.49	1.00
REDC_GUI_2015_00483	3249	260.1535946	239	18525	97.71	1.00
REDC-GUI-2015-00502	1747	139.6400127	120	18505	97.61	1.00
REDC-GUI-2015-00497	2779	126.1059655	102	18475	97.45	1.00
REDC_GUI_2015_00469	3207	141.0937813	113	14298	75.42	0.73
IPDPFHGINSP_GUI_2015_4786	3060	166.5768237	143	18515	97.66	1.00
EM_FORE_2015_1437	3551	273.011604	250	18524	97.71	1.00
REDC_GUI_2015_00470	2662	122.102748	75	14289	75.37	0.73
IPDPFHGINSP_GUI_2015_5117	4141	199.5283507	146	18486	97.51	1.00
GUI_CTS_2015_0052	4088	288.9821721	222	18525	97.71	1.00
EM_FORE_2015_1079	3064	243.8935598	226	18523	97.70	1.00
EM_FORE_2015_1076	1395	93.96302548	73	18446	97.29	1.00
EM_COY_2015_017787	2872	141.2252756	110	18471	97.43	1.00
IPDPFHGINSP_GUI_2015_4909	3318	191.8508888	104	18482	97.48	1.00
IPDPFHGINSP_GUI_2015_5339	3737	175.3401023	145	18446	97.29	1.00
REDC_GUI_2015_00494B	6001	503.1569703	429	18526	97.72	1.00
EM_FORE_2015_875	2410	110.186033	83	16135	85.10	0.80
REDC_GUI_2015_00589	5085	347.630202	104	18453	97.33	1.00
REDC_GUI_2015_00545	4848	354.4095153	174	18526	97.72	1.00
REDC_GUI_2015_00534	510	35.91877209	20	7494	39.53	0.53
REDC_GUI_2015_00627	1080	67.51901472	31	10850	57.23	0.63

EM_FORE_2015_1415	3670	173.4144733	110	13377	70.56	0.83
EM-FORE_2015_1160	3909	174.4608365	93	14148	74.62	0.87
EM-FORE-2015-548	5744	426.0480511	361	18525	97.71	1.00
REDC_GUI_2015_00576	1116	83.607416	69	13776	72.66	0.77
EM-FORE-2015-631	3288	235.9074846	202	18517	97.67	1.00
EM-FORE-2015-838	4549	307.7389103	240	18510	97.63	1.00
EM-FORE-2015-664	9550	712.8723561	500	18526	97.72	1.00
EM-FORE-2015-1414	3866	249.2328182	198	18526	97.72	1.00
EM-FORE-2015-669	4074	202.3179493	161	18368	96.88	1.00
CON-10193	7247	535.1032755	256	18521	97.69	1.00
EM_FORE_2015-1789	3921	171.1360831	82	15665	82.63	0.63
EM_FORE_2015-1971	5869	455.6065721	352	18526	97.72	1.00
REDC_GUI_2015_01285	7249	563.2619864	436	18526	97.72	1.00
CON-11010	4241	330.3677409	251	18524	97.71	1.00
CON-10512	7076	557.9105966	473	18526	97.72	1.00
CON-10590	6109	480.8302126	426	18526	97.72	1.00
CON-10786	5159	402.6279867	359	18526	97.72	1.00
EM_COY_2015_023747	3528	267.0373437	211	18524	97.71	1.00
KG167	4634	350.1237407	287	17598	92.82	0.90
KG168	4320	329.1075479	287	18524	97.71	1.00
EM_FORE_2015-2417	4412	341.4797721	273	18526	97.72	1.00
EM_COY_2015_023888	4723	215.2130914	130	15608	82.33	0.87
EM_FORE_2015-2531	3888	164.9988396	83	15549	82.01	0.87
EM_FORE_2015-2533	7483	598.9246268	373	18525	97.71	1.00
EM_FORE_2015-2547	3026	135.7723509	101	17455	92.07	0.93
EM_FORE_2015-2549	1170	51.67878053	30	11127	58.69	0.70
CON12930	2226	167.0988449	113	18500	97.58	1.00
EM_FORE_2015_2878	4517	309.1782794	260	18526	97.72	1.00
EM_FORE_2015_2781	7814	379.9034759	314	18494	97.55	1.00
REDC_GUI_2015_02242	7468	608.7403344	546	18526	97.72	1.00
REDC_GUI_2015_01408	5015	301.8150219	273	18525	97.71	1.00
REDC_GUI_2015_01323	6804	317.1770136	261	17569	92.67	0.90
REDC_GUI_2015_01165	4338	238.3866238	219	17454	92.06	0.90

Supplementary table 4

Lab ID	Prefecture	Sous Prefecture	Village	Ct Value	Date Sample Taken	PCR Date	Sequencing Date	Protocol
EM_COY_2015_014370	Forecariah	Sikhourou		20.82	2015-04-07	2015-04-18	2015-04-19	19 reactions
EM_COY_2015_015802	Coyah	Maneah	Kalokhoyah	24.34	2015-04-14	2015-04-20	2015-04-20	11 reactions v1
EM_COY_2015_015815	Fria	Doula		26.52	2015-04-14	2015-04-20	2015-04-20	11 reactions v1
EM_GUI_2015_004674	Siguiri		Lero	15.81	2015-03-26	2015-04-20	2015-04-21	11 reactions v1
EM_COY_2015_015972	Forecariah	Farmoriah		18.79	2015-04-20	2015-02-22	2015-04-22	11 reactions v2
EM_COY_2015_015986	Fria	Baguinet		22.34	2015-04-20	2015-04-22	2015-04-22	11 reactions v2
EM_COY_2015_013671	Coyah	Wonkifong		17.27	2015-03-12	2015-04-22	2015-04-23	11 reactions v2
EM_COY_2015_013731	Coyah	Lansanaya		17.88	2015-03-14	2015-04-22	2015-04-23	11 reactions v2
EM_COY_2015_014098	Conakry		Enta Kissosso	20.66	2015-03-26	2015-04-23	2015-04-24	11 reactions v3
EM_COY_2015_014100	Conakry		Enta Kissosso	19.66	2015-03-26	2015-04-23	2015-04-24	11 reactions v3
EM_COY_2015_013857	Forecariah		Pamelap	17.04	2015-03-18	2015-04-24	2015-04-25	11 reactions v3
EM_COY_2015_013962	Forecariah	Morikanya		18.07	2015-03-22	2015-04-24	2015-04-25	11 reactions v3
EM_COY_2015_015980	Forecariah	Allossoyah	Katabv©	18.98	2015-04-20	2015-04-24	2015-04-25	11 reactions v3
EM_COY_2015_015982	Forecariah	Doleyah		18.33	2015-04-20	2015-04-24	2015-04-26	11 reactions v3
EM_FORE_2015_216	Forecariah	Farmoriah		19.61	2015-04-30	2015-05-05	2015-05-06	11 reactions v3
EM_FORE_2015_209	Forecariah	Farmoriah		18.36	2015-04-28	2015-05-22	2015-05-23	11 reactions v3
IPDPFHGINSP_GUI_2015_6505	Forecariah			32.00	2015-05-03	2015-05-06	2015-05-07	11 reactions v3
EM_COY_2015_016238	Forecariah	Sikhourou	Mangba	18.59	2015-05-03	2015-05-06	2015-05-07	11 reactions v3
EM_COY_2015_016263	Forecariah	Moussayah		17.75	2015-05-04	2015-05-07	2015-05-09	11 reactions v3
EM_COY_2015_016267	Dubreka	Commune Urbaine	Dioumaya	28.05	2015-05-04	2015-05-07	2015-05-09	11 reactions v3
EM_COY_2015_016414	Dubreka	Dembaya	Dembaya	22.16	2015-05-11	2015-05-13	2015-05-14	11 reactions v3
EM_COY_2015_016456	Dubreka	Tanene	Dembaya	17.62	2015-05-12	2015-05-13	2015-05-14	11 reactions v3
EM_COY_2015_016449	Forecariah	Farmoriah	Maferinyah	15.98	2015-05-11	2015-05-13	2015-05-14	11 reactions v3
EM_COY_2015_016483	Boke	Kamsar	Filima centre	21.60	2015-05-13	2015-05-14	2015-05-16	11 reactions v3
EM_COY_2015_016515	Dubreka	Tanene	Dembaya	19.26	2015-05-14	2015-05-14	2015-05-17	11 reactions v3
EM_COY_2015_016531	Dubreka	Tanene	Dembaya	17.32	2015-05-14	2015-05-14	2015-05-18	11 reactions v3
EM_COY_2015_014060	Dubreka	Ansoumania	Fofomere	22.09	2015-03-25	2015-05-14	2015-05-15	11 reactions v3
EM_COY_2015_016236	Forecariah	Sikhourou	Dembuya	23.44	2015-05-03	2015-05-15	2015-05-18	11 reactions v3
EM_COY_2015_016617	Dubreka	Tanene	Dembaya	19.27	2015-05-16	2015-05-17	2015-05-18	11 reactions v3
EM_COY_2015_016278	Forecariah	Kaliah	Bokariah	17.20	2015-05-05	2015-05-17	2015-05-18	11 reactions v3
EM_COY_2015_016642	Forecariah		Doleyah	18.75	2015-05-17	2015-05-17	2015-05-19	11 reactions v3
EM_COY_2015_016293	Forecariah		Dembuya	15.90	2015-05-06	2015-05-18	2015-05-19	11 reactions v3
EM_COY_2015_013576	Coyah		Bonfv©	23.49	2015-03-09	2015-05-18	2015-05-19	11 reactions v3
EM_COY_2015_013795	Forecariah	Allassayah		20.39	2015-03-16	2015-05-15	2015-05-18	11 reactions v3
EM_COY_2015_014102	Conakry		Enta Kissosso	23.04	2015-03-26	2015-05-20	2015-05-21	11 reactions v3

EM_COY_2015_016743	Boke	Kamsar	Bagatain	28.60	2015-05-19	2015-05-20	2015-05-21 11 reactions v3
EM_COY_2015_016800	Dubreka	Tanene	Dixin Bouramaya	20.41	2015-05-20	2015-05-21	2015-05-22 11 reactions v3
EM_COY_2015_016464	Dubreka	Tanene	Dembaya	19.46	2015-05-12	2015-05-13	2015-05-14 11 reactions v3
EM_FORE_2015_343	Forecariah	Allossoyah	Allassayah centre	29.81	2015-05-11	2015-05-21	2015-05-22 19 rx
EM_COY_2015_016854	Dubreka	Tanene	Tanene	31.52	2015-05-22	2015-05-23	2015-05-24 11 reactions v3
EM_COY_2015_014465	Forecariah	Sikhourou		29.24	2015-04-11	2015-05-20	2015-05-21 11 reactions v3
EM_FORE_2015_387	Forecariah	Commune Urbaine	Tatgui II	28.94	2015-05-16	2015-05-21	2015-05-22 11 reactions v3
EM_COY_2015_017021	Fria	Banguine		25.99	2015-05-25	2015-05-27	2015-05-29 11 reactions v3
EM_COY_2015_017018	Forecariah	Farmoriah	Taliko	24.05	2015-05-26	2015-05-27	2015-05-31 11 reactions v3
EM_COY_2015_017057	Dubreka	Commune Urbaine	Kagbelen Plateau	31.63	2015-05-27	2015-05-28	2015-05-29 11 reactions v3
EM_COY_2015_016852	Dubreka	Tanene	Tanene	32.38	2015-05-22	2015-05-28	2015-05-31 11 reactions v3
EM_COY_2015_017091	Boke	Kamsar	Kamsar	23.70	2015-05-28	2015-05-31	2015-06-01 11 reactions v3
EM_COY_2015_017135	Dubreka			25.03	2015-05-29	2015-05-31	2015-06-01 11 reactions v3
EM_COY_2015_015984	Fria	Baguinet		31.63	2015-04-20	2015-05-22	2015-05-25 11 reactions v3
EM_COY_2015_017174	Forecariah	Kouliyire		28.72	2015-05-30	2015-06-06	2015-06-05 19 rx
EM_COY_2015_017238	Dubreka			14.68	2015-05-31	2015-06-06	2015-06-05 11 reactions v3
EM_COY_2015_017240	Dubreka	Tanene	Dixinn Bouraya	17.92	2015-05-31	2015-06-05	2015-06-08 11Rx v3 + Rx9 and Rx10 for region 5
EM_COY_2015_014261	Forecariah	Maferinyah	Moribaya	28.34	2015-04-02	2015-06-05	2015-06-09 19rx + F33/R35
EM_FORE_2015_695	Forecariah	Kaliah		24.90	2015-06-07	2015-06-09	2015-06-10 11Rx
EM_FORE_2015_696	Forecariah	Moussayah		20.80	2015-06-07	2015-06-09	2015-06-10 11Rx
EM_FORE_2015_697	Forecariah	Moussayah		19.10	2015-06-07	2015-06-10	2015-06-12 11Rx
EM_COY_2015_017574	Boke	Wakiria	Wakiria	20.76	2015-06-10	2015-06-11	2015-06-12 11Rx
EM_COY_2015_017664	Dubreka	Dixinn	Bouramaya		2015-06-12	2015-06-16	2015-06-17 11Rx
EM_COY_2015_017666	Dubreka	Dixinn	Bouramaya		2015-06-12	2015-06-16	2015-06-17 11Rx
IPDPFHGINSP_GUI_2015_5038	Conakry	Matam	Matam Lido	19.56	2015-04-01	2015-06-17	2015-06-18 11Rx
EM_FORE_2015_781	Forecariah	Moussayah	Doloyah	17.30	2015-06-13	2015-06-18	2015-06-19 11Rx
EM_COY_2015_017788	Dubreka			19.54	2015-06-16	2015-06-18	2015-06-19 11Rx
EM_COY_2015_017865	Dubreka	Tanene	Dembaya	23.58	2015-06-18	2015-06-19	2015-06-20 11Rx
EM_FORE_2015_816	Forecariah	Sikhourou	Koloteyah	18.90	2015-06-15	2015-06-19	2015-06-21 11Rx
EM_COY_2015_017790	Dubreka			21.67	2015-06-16	2015-06-21	2015-06-22 11Rx
KG12	Boke	Kamsar		18.50	2015-05-27	2015-06-22	2015-06-23 11Rx
KG90	Boke	Boke	Tamaranssy	18.80	2015-06-19	2015-06-23	2015-06-24 11Rx
EM_FORE_2015_934	Forecariah	Farmoriah		21.60	2015-06-23	2015-06-24	2015-06-25 19rx + F33/R35
EM_FORE_2015_896	Forecariah			22.30	2015-06-20	2015-06-23	2015-06-25 19rx + F33/R35
CON-8559	Conakry	Matam			2015-06-21	2015-06-28	2015-06-29 11Rx
KG45	Boke	Wakiniaya		23.20	2015-06-09	2015-06-29	2015-06-30 11Rx
EM_FORE_2015_1023	Forecariah	Benty		14.61	2015-06-29	2015-06-29	2015-06-30 11Rx

CON-8811	Dubreka	Dixinn			2015-06-27	2015-06-30	2015-07-01 11Rx
EM_FORE_2015_1024	Forecariah	Benty			2015-06-29	2015-06-30	2015-07-01 11Rx
KG35	Boke	Boke	Tamaranssy	17.80	2015-06-08	2015-06-29	2015-06-30 11Rx
EM_FORE_2015_1047	Forecariah	Benty	Makale Centre	15.66	2015-06-30	2015-07-01	2015-07-02 11Rx
EM_COY_2015_022059	Forecariah			20.32	2015-07-02	2015-07-03	2015-07-03 Rx19 + 11rx.10 instead of 19Rx.17
EM_FORE_2015_1140	Forecariah	Benty	Kigbalie	17.01	2015-07-03	2015-07-04	2015-07-04 Rx19 + 11rx.10
GUI_CTS_2015_0050	Boke	Boke centre		17.00	2015-06-20	2015-07-05	2015-07-05 19Rx
KG87	Boke	Boke	Tamarassy	20.30	2015-06-19	2015-07-11	2015-07-13 11Rx
KG88	Boke	Boke	Tamarassy	24.50	2015-06-19	2015-07-11	2015-07-13 11Rx
EM_FORE_2015_1313	Forecariah	C.U.	Koutoumaliah	19.40	2015-07-10	2015-07-12	2015-07-14 11Rx
KG80	Boke	Boke	Tamarassy	21.50	2015-06-18	2015-07-11	2015-07-13 11Rx
KG91	Boke	Kamsar	Bagataille	20.96	2015-06-20	2015-07-11	2015-07-13 11Rx
EM_FORE_2015_1118	Forecariah	Benty		19.40	2015-07-02	2015-07-13	2015-07-15 11Rx
REDC-GUI-2015-00402	Conakry	Ratoma	Koloma	21.00	2015-07-08	2015-07-11	2015-07-14 11Rx
IPDPFHGINSP_GUI_2015_6899	Boke	Kamsar	Filima	24.49	2015-05-14	2015-07-14	2015-07-17 19rx
GUI_CTS_2015_0051	Boke	Boke centre		19.00	2015-06-21	2015-07-13	2015-07-17 11Rx + 19Rx
IPDPFHGINSP_GUI_2015_7070	Forecariah	Sikhourou	Dalouyah centre	23.42	2015-05-18	2015-07-14	2015-07-18 19rx
REDC_GUI_2015_00483	Conakry	Ratoma	Koloma	24.40	2015-07-12	2015-07-15	2015-07-18 11Rx
REDC-GUI-2015-00502	Conakry	Ratoma	Koloma	24.12	2015-07-13	2015-07-15	2015-07-18 11Rx
REDC-GUI-2015-00497	Conakry	Matam	Boussoura	22.05	2015-07-12	2015-07-15	2015-07-18 11Rx
REDC_GUI_2015_00469	Conakry	Mataur	Bahpot	31.67	2015-07-11	2015-07-16	2015-07-21 19Rx but F33/R36 used
IPDPFHGINSP_GUI_2015_4786	Conakry	Matoto	Sangoyah Cite Secteur1	23.47	2015-03-26	2015-07-14	2015-07-21 11Rx + 19Rx
EM_FORE_2015_1437	Forecariah	Benty		19.87	2015-07-15	2015-07-21	2015-07-22 Rx11
REDC_GUI_2015_00470	Conakry	Matam	Bonfi	26.80	2015-07-11	2015-07-17	2015-07-23 19Rx + F25/R29 to replace Rx19.14 and F33/R36 to replace Rx19.17
IPDPFHGINSP_GUI_2015_5117	Dubreka	Dubreka Centre	Ansoumania Plateau	23.20	2015-04-03	2015-07-23	2015-07-24 RX19
GUI_CTS_2015_0052	Boke	Kamsar	Bagataille	30.50	2015-06-25	2015-07-23	2015-07-24 Rx19.1-2-3-4 + RX11 rest
EM_FORE_2015_1079	Forecariah	Benty	Kigbaly	22.68	2015-07-01	2015-07-26	2015-07-29 11Rx
EM_FORE_2015_1076	Forecariah	Benty	Kigbaly	20.65	2015-07-01	2015-07-26	2015-07-29 11Rx
EM_COY_2015_017787	Dubreka			29.08	2015-06-16	2015-07-23	2015-07-29 19Rx + F29/R32 instead of 15
IPDPFHGINSP_GUI_2015_4909	Conakry	Matam	Bonfi	24.98	2015-03-29	2015-07-13	2015-07-22 11Rx + 19Rx
IPDPFHGINSP_GUI_2015_5339	Conakry	Matoto	Yimbayah Soloprimo	27.76	2015-04-08	2015-07-17	2015-07-22 19Rx + F31/R34 to replace Rx19.17
REDC_GUI_2015_00494B	Conakry	Ratoma	Koloma	19.00	2015-07-12	2015-07-16	2015-07-18 11Rx
EM_FORE_2015_875	Forecariah	Sikhourou	Koloteyah	30.90	2015-06-17	2015-07-26	2015-07-29 19Rx + 11Rx.10 instead of 19Rx.17
REDC_GUI_2015_00589	Conakry	Ratoma	Nongo Carrefour	20.39	2015-07-15	2015-07-29	2015-08-01 11Rx + 19Rx.3 and 19Rx.4 instead of 11Rx.2
REDC_GUI_2015_00545	Conakry	Ratoma	Koloma	19.92	2015-07-15	2015-07-28	2015-08-01 11Rx

REDC_GUI_2015_00534	Forecariah	Forecariah		20.35	2015-07-15	2015-07-28	2015-08-01 11Rx
REDC_GUI_2015_00627	Conakry	Matoto	Dadoundy	27.02	2015-07-18	2015-07-29	2015-08-01 11Rx.1 + 19Rx.1 and 19Rx.2 instead of 11Rx.11 + F25/R29 instead of 11Rx.8 2015-08-01 11Rx.1 + 19Rx.18/19 instead of 11Rx.8
EM_FORE_2015_1415	Forecariah	Allossoyah	Basiah	29.60	2015-07-20	2015-08-01	2015-08-03 19Rx + 11Rx.11 instead of 19Rx.19 + 11Rx.10 instead of 19Rx.17
EM-FORE_2015_1160	Forecariah	Maferinyah	Guereyah	29.00	2015-07-13	2015-08-01	2015-08-03 19Rx + F33/R35 + F25/R29 + F29/R32 for those not working
EM-FORE-2015-548	Forecariah	Moussayah	Sinkina	17.81	2015-05-27	2015-08-03	2015-08-03 11Rx
REDC_GUI_2015_00576	Conakry	Ratoma	Nassouroulaye	26.29	2015-07-17	2015-07-29	2015-08-03 11rX +F25/R29
EM-FORE-2015-631	Forecariah	Moussayah		17.81	2015-06-02	2015-08-04	2015-08-04 11Rx
EM-FORE-2015-838	Forecariah	Farmoriah	Fanye	22.78	2015-06-16	2015-08-04	2015-08-04 11Rx
EM-FORE-2015-664	Forecariah	Moussayah	Yaworeah	13.75	2015-06-04	2015-08-04	2015-08-04 11Rx
EM-FORE-2015-1414	Forecariah	Benty	M_gbale	22.08	2015-07-13	2015-08-05	2015-08-05 11Rx
EM-FORE-2015-669	Forecariah	Moussayah		25.02	2015-06-05	2015-08-05	2015-08-05 19Rx
CON-10193	Conakry	Matam		19.50	2015-08-03	2015-08-06	2015-08-06 11Rx
EM_FORE_2015-1789	Forecariah	Moussayah	Doto	26.29	2015-08-03	2015-08-11	2015-08-12 19Rx + 11Rx10 + 19Rx21+22
EM_FORE_2015-1971	Forecariah	Moussayah	Doto Center	21.05	2015-08-14	2015-08-15	2015-08-15 11Rx
REDC_GUI_2015_01285	Conakry	Ratoma	Sonfonia Gare II	18.61	2015-08-24	2015-08-30	2015-08-30 11Rx
CON-11010	Conakry	Ratoma		26.00	2015-08-23	2015-08-30	2015-08-31 11Rx
CON-10512	Conakry	Matam		23.87	2015-08-11	2015-09-02	2015-09-02 11Rx
CON-10590	Conakry	Matam		18.66	2015-08-13	2015-08-31	2015-09-02 11Rx
CON-10786	Conakry	Ratoma		24.26	2015-08-17	2015-09-01	2015-09-02 11Rx
EM_COY_2015_023747	Dubreka	Samatran		23.36	2015-09-09	2015-09-10	2015-09-11 11Rx
KG167	Boke	Boke	Dabis Kasongony	20.00	2015-06-29	2015-09-12	2015-09-13 11Rx
KG168	Boke	Boke	Tamarannsy	20.66	2015-06-29	2015-09-13	2015-09-14 11Rx
EM_FORE_2015-2417	Forecariah	Forecariah	Kitrin		2015-09-15	2015-09-19	2015-09-20 11Rx
EM_COY_2015_023888	Dubreka	Samatran		35.65	2015-09-15	2015-09-18	2015-09-15 19Rx
EM_FORE_2015-2531	Forecariah	Forecariah	Tana	27.67	2015-09-26	2015-09-27	2015-09-27 19Rx
EM_FORE_2015-2533	Forecariah	Forecariah	Tana	19.40	2015-09-26	2015-09-27	2015-09-28 11Rx
EM_FORE_2015-2547	Forecariah	Forecariah	Tana	18.14	2015-09-26	2015-09-27	2015-09-28 19Rx
EM_FORE_2015-2549	Forecariah	Forecariah	Tana	26.85	2015-09-26	2015-09-27	2015-09-29 19Rx
CON12930	Conakry	Ratoma	Sonfonia	21.50	2015-10-13	2015-10-14	2015-10-15 11Rx
EM_FORE_2015_2878	Forecariah	Kaleah	Kindoyah	16.67	2015-10-24	2015-10-24	2015-10-25 11RX (1-10) + 19RX 19.18 and 19.19
EM_FORE_2015_2781	Forecariah	Kaleah	Kondeyah	16.27	2015-10-13	2015-10-15	2015-10-16 11Rx
REDC_GUI_2015_02242	Forecariah	Forecariah	Kindoyah	14.60	2015-10-24	2015-10-26	2015-10-19 11Rx

REDC_GUI_2015_01408	Conakry	Ratoma	Dar Es Salam 2	18.35	2015-09-01	2015-10-29	2015-10-30	11Rx (1-3-4-6-7-8-9-10) + 19Rx (3-4-9-10-18-19)
REDC_GUI_2015_01323	Conakry	Ratoma	Dar Es Salam	25.67	2015-08-27	2015-10-29	2015-10-30	19Rx (all except 17) + 11Rx (10)
REDC_GUI_2015_01165	Conakry	Ratoma	Kapororails	22.68	2015-08-18	2015-10-29	2015-10-30	11Rx (3-4-6-7-8-9-10) + 19Rx (1-2-3-4-9-10-18-19)